

An Efficient, Reliable, Vibration-Free Refrigerant Pump for Space Applications, Phase II

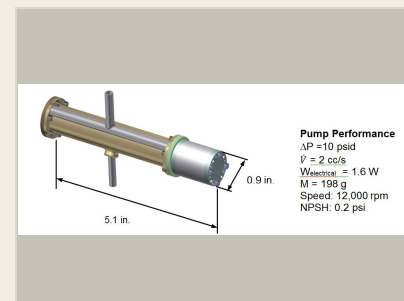
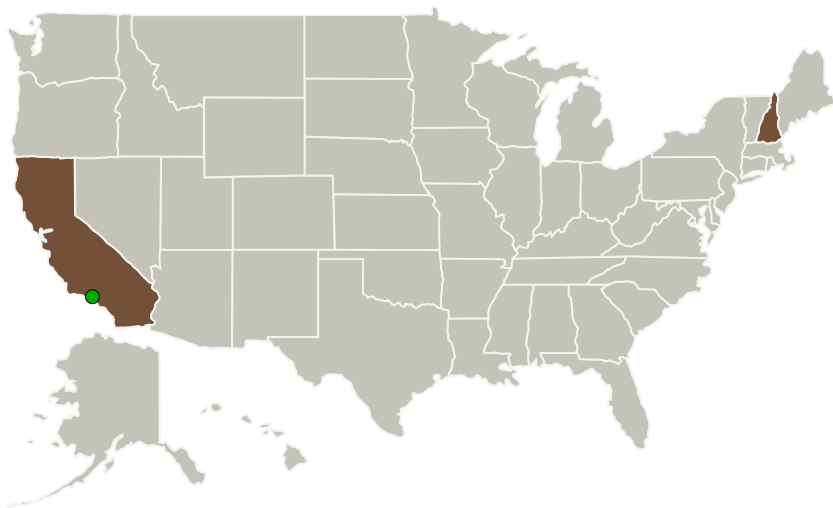
Completed Technology Project (2017 - 2019)



Project Introduction

NASA's future remote sensing science missions require advanced thermal management technologies to maintain multiple instruments at very stable temperatures and utilize waste heat to keep other critical subsystems above minimum operational temperatures. Two-phase pumped loops are an ideal solution for these applications. A critical need for these pumped loops is a refrigerant pump that reliably circulates very slightly subcooled liquid refrigerant in the loop. Creare proposes to develop a reliable, vibration-free pump that has innovative features to prevent cavitation in the pumping chamber and in the hydrodynamic fluid bearings, enhancing the overall pumped loop reliability. The development of the refrigerant pump is built on Creare's proven pump technologies for space applications. In Phase I, we designed and built a proof-of-concept refrigerant pump and demonstrated its ability to reliably achieve the target flow rate and pressure rise, with a minimum required Net Positive Suction Head (NPSH) less than 0.5 psi. In Phase II, we will optimize the pump rotor, bearing and motor designs; assemble a pump prototype; demonstrate its reliability and its steady state and transient performance under prototypical inlet conditions; and deliver it to NASA JPL for further performance evaluation.

Primary U.S. Work Locations and Key Partners



An Efficient, Reliable, Vibration-Free Refrigerant Pump for Space Applications, Phase II Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
Creare LLC	Lead Organization	Industry	Hanover, New Hampshire
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	New Hampshire

Project Transitions

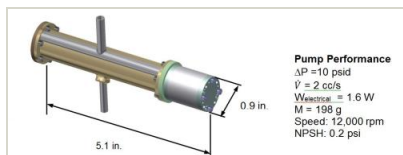
▶ **May 2017:** Project Start

✓ **August 2019:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/141109>)

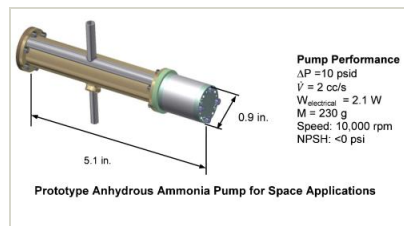
Images



Briefing Chart Image

An Efficient, Reliable, Vibration-Free Refrigerant Pump for Space Applications, Phase II Briefing Chart Image

(<https://techport.nasa.gov/image/131898>)



Final Summary Chart Image

An Efficient, Reliable, Vibration-Free Refrigerant Pump for Space Applications, Phase II

(<https://techport.nasa.gov/image/129070>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Creare LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

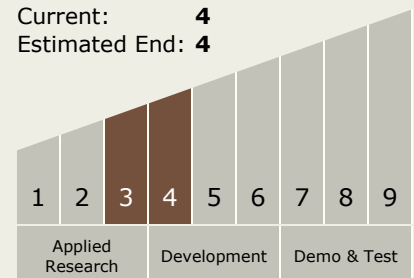
Carlos Torrez

Principal Investigator:

Thomas Conboy

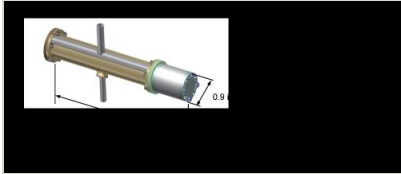
Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Final Summary Chart Image

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(<https://techport.nasa.gov/image/126092>)

Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.2 Thermal Control Components and Systems
 - └ TX14.2.2 Heat Transport

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System